

WHAT IS CLAIMED IS:

1. An image processing apparatus comprising:
acquisition device which acquires at least one
color signal value pair indicating color signal values
5 from an image;
determination device which determines an image
processing parameter on the basis of the acquired color
signal value pair;
registration device which registers the image
10 processing parameter determined by said determination
device; and
conversion device which converts color signal
values of an input image on the basis of the image
processing parameter determined by said determination
15 device, and outputs a converted image as an output
image.
2. The apparatus according to claim 1, wherein said
acquisition device acquires the color signal value pair
on the basis of color signal values of corresponding
20 pixels in a first image, and a second image obtained by
retouching the first image.
3. The apparatus according to claim 1, wherein said
acquisition device acquires the color signal value pair
from one image recorded on a detachable recording
25 medium.
4. The apparatus according to claim 1, wherein said
acquisition device acquires the color signal value pair

from color signal values of corresponding pixels in a first image recorded on a detachable recording medium, and a second image which is recorded on the detachable recording medium and is different from the first image.

5 5. The apparatus according to claim 1, further comprising designation device which allows a user to designate a region on the image, and wherein said acquisition device acquires at least one color signal value pair corresponding to the region designated by
10 said designation device.

6. The apparatus according to claim 2, wherein for each of a plurality of grid points set on a color space,

 said acquisition device extracts pixels having
15 color signal values near a grid point of interest from the first image, and extracts pixels in the second image corresponding to the extracted pixels,

 said acquisition device determines a color signal value after change of the grid point of interest on the
20 basis of the signal values of the pixels extracted from the first and second images, and

 said acquisition device sets a color signal value of the grid point of interest, and the determined color signal value after change as the color signal value
25 pair.

7. The apparatus according to claim 2, wherein the first and second images have the same image size, and

are stored in a storage medium in the same image format.

8. The apparatus according to claim 2, wherein said conversion device processes a sensed image obtained from image sensing device as the input image, and the first and second images are thumbnail images obtained by reducing the sensed image.

9. The apparatus according to claim 1, wherein said acquisition device acquires a designated value pair consisting of first and second color signal values on the basis of first and second designated positions designated on one or two images, and determines the color signal value pair on the basis of the designated value pair.

10. The apparatus according to claim 8, wherein for each of a plurality of grid points set on a color space,

said acquisition device extracts designated value pairs, the first color signal values of which are located near a grid point of interest,

said acquisition device determines a color signal value after change of the grid point of interest on the basis of changes of the first and second color signal values in the extracted designated value pairs, and

said acquisition device sets the color signal value of the grid point of interest, and the determined color signal value after change as the color signal

value pair.

11. The apparatus according to claim 9, wherein the first and second images have the same image size, and are stored in a storage medium in the same image
5 format.

12. The apparatus according to claim 9, wherein said conversion device processes a sensed image obtained from image sensing device as the input image, and
the first and second images are thumbnail images
10 having a smaller size than the sensed image.

13. The apparatus according to claim 1, further comprising:

selection device which selects one of a plurality of processing modes using different image processing
15 parameters, and

wherein said registration device registers the image processing parameter determined by said determination device as one of the plurality of processing modes, and

20 when said selection device selects one of the processing modes, said conversion device executes a conversion process using the image processing parameter registered by said registration device.

14. The apparatus according to claim 1, wherein
25 holding device stores the image processing parameter determined by said determination device in a first storage device, and

said conversion device stores the output image in a second storage medium.

15. The apparatus according to claim 1, further comprising:

5 display device which displays the image, and wherein said registration device registers a plurality of different image processing parameters in correspondence with a processing mode, and the plurality of different image processing
10 parameters are displayed on said display device.

16. The apparatus according to claim 1, wherein the conversion process includes:

inputting a sensed image obtained by an image sensing unit as an input image,

15 processing the sensed image by interpolation so that all pixels of respective color components have values;

amplifying a color difference of the image that has undergone the interpolation process;

20 applying gamma conversion to the image whose color difference has been amplified; and

applying hue correction to the image that has undergone the gamma conversion, and

said determination device changes parameters in
25 the interpolation process, color difference amplification, and hue correction.

17. The apparatus according to claim 1, wherein said

determination device applies inverse conversion of said conversion device to the color signal value before conversion of the color signal value pair using an image processing parameter which is set in advance, and

5 said determination device changes the image processing parameter to reduce a difference between a color signal value obtained by processing the color signal value obtained by the inverse conversion by said conversion device, and the color signal value after

10 conversion of the color signal value pair.

18. The apparatus according to claim 1, wherein the conversion process has:

multi-dimensional lookup table conversion device which converts an image using a multi-dimensional

15 lookup table to obtain an output image, and

 said determination device changes the multi-dimensional lookup table on the basis of the color signal value pair.

19. The apparatus according to claim 18, wherein the

20 multi-dimensional lookup table is a three-dimensional lookup table including R, G, and B as elements.

20. An image sensing apparatus comprising:

 an image sensing unit; and

 an image processing apparatus of claim 1,

25 wherein said image processing apparatus processes sensed image data obtained by said image sensing unit as the input image.

21. An image processing method comprising:
acquiring at least one color signal value pair
indicating color signal values from an image;
determining an image processing parameter on the
5 basis of the acquired color signal value pair;
registering the image processing parameter
determined in the determination step; and
converting color signal values of an input image
on the basis of the image processing parameter
10 determined in the determination step, and outputting a
converted image as an output image.
22. An apparatus for generating a color conversion
table, comprising:
storage device which stores first and second
15 images, pixel values of which are expressed on an
N-dimensional color space;
generation device which generates an
N-dimensional color conversion table on the basis of
differences between pixel values of corresponding
20 pixels in the first and second images; and
adjustment device which adjusts generation of
table values of the color conversion table by said
generation device so that a change amount of a pixel
value defined by the color conversion table generated
25 by said generation device does not exceed a
predetermined value.
23. The apparatus according to claim 22, wherein said

generation device comprises:

detection device which detects, from the first image, pixels having pixel values within a predetermined distance range from a grid point value of a grid point selected from respective grid points of the N-dimensional color conversion table;

calculation device which calculates an average value of differences between pixel values of corresponding pixels in the first and second images in association with the pixels detected by said detection device; and

determination device which determines a value of the selected grid point on the basis of the average value calculated by said calculation device.

24. The apparatus according to claim 22, wherein when a distance between the pixel values of the corresponding pixels on the color space exceeds a threshold value, said adjustment device adjusts the difference between the pixel values of the corresponding pixels on the basis of the distance and the threshold value.

25. The apparatus according to claim 24, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be pixel values in the first image, $(B_0, B_1, B_2, \dots, B_N)$ be pixel values of corresponding pixels in the second image, and Diff be the distance, and when the distance Diff given by:

$$Diff = \sqrt{(A_0 - B_0)^2 + (A_1 - B_1)^2 + (A_2 - B_2)^2 + \dots + (A_n - B_n)^2}$$

is larger than a predetermined threshold value T, said adjustment device multiplies differences between the corresponding pixels for respective components by a value obtained based on the threshold value T and the distance Diff.

26. The apparatus according to claim 24, wherein said adjustment device determines, as the distance, a maximum value Diff of differences between pixel values for respective components of corresponding pixels of the first and second images, and when the distance is larger than a predetermined threshold value T, said adjustment device multiplies the differences for respective components by a value obtained based on the threshold value T and the distance Diff.

27. The apparatus according to claim 22, wherein when a distance between pixel values before and after conversion by the color conversion table generated by said generation device exceeds a threshold value, said adjustment device adjusts a corresponding table value in the color conversion table.

28. The apparatus according to claim 27, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be pixel values before conversion by the color conversion table, $(B_0, B_1, B_2, \dots, B_N)$ be pixel values after conversion, and Diff be the distance, and when the distance Diff given by:

$$Diff = \sqrt{(A_0 - B_0)^2 + (A_1 - B_1)^2 + (A_2 - B_2)^2 + \dots + (A_N - B_N)^2}$$

is larger than a predetermined threshold value T, said

adjustment device updates the color conversion table by multiplying the corresponding table value by a value obtained based on the threshold value T and the distance Diff.

5 29. The apparatus according to claim 27, wherein said adjustment device determines, as the distance, a maximum value Diff of differences between pixel values before and after conversion by the color conversion table for respective components, and when the distance
10 is larger than a predetermined threshold value T, said adjustment device updates the color conversion table by multiplying the corresponding table value by a value obtained based on the threshold value T and Diff.

30. The apparatus according to claim 22, wherein when
15 a difference between grid point data of the color conversion table generated by said generation device and a reference table is not less than a predetermined value, said adjustment device adjusts the grid point data of the color conversion table.

20 31. The apparatus according to claim 30, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be grid point data of the color conversion table, $(B_0, B_1, B_2, \dots, B_N)$ be grid point data of the reference table, and Diff be the difference, and when the difference Diff given by:

25
$$Diff = \sqrt{(A_0 - B_0)^2 + (A_1 - B_1)^2 + (A_2 - B_2)^2 + \dots + (A_n - B_n)^2}$$

is larger than a predetermined threshold value T, said adjustment device multiplies the grid point data by a

value obtained based on the threshold value T and the difference Diff.

32. The apparatus according to claim 31, wherein when a maximum value Diff of differences between
5 corresponding grid point data of the color conversion table and reference table for respective components is larger than the threshold value T, said adjustment device multiplies respective components of the grid point data of the color conversion table by a value
10 obtained based on the threshold value T and Diff.

33. The apparatus according to claim 22, further comprising:

conversion device which convertes data of respective grid points of the color conversion table
15 generated by said generation device into data on an M-dimensional space.

34. A method for generating a color conversion table, comprising:

generating an N-dimensional color conversion
20 table on the basis of differences between pixel values of corresponding pixels in first and second images, pixel values of which are expressed on an N-dimensional color space; and

adjusting generation of table values of the color
25 conversion table in the generating step so that a change amount of a pixel value defined by the color conversion table generated in the generation step does

not exceed a predetermined value.

35. A color conversion apparatus comprising:

input device which inputs image data;

conversion device which converts the image data

5 input by said input device using a color conversion

table generated by a conversion table generation

apparatus of claim 22; and

output device which outputs image data converted

by said conversion device.

10 36. The apparatus according to claim 35, wherein for
each pixel value of the image data,

said conversion device extracts a grid point near
the pixel value from the conversion table,

said conversion device calculates a distance
15 between the pixel value and the extracted grid point,
and

said conversion device obtains a pixel value
after conversion of the pixel value on the basis of
grid point values of the extracted grid point and grid
20 points near the extracted grid point, and the
calculated distance.

37. A color conversion method comprising:

inputting image data;

converting the image data input in the input step
25 using a color conversion table generated by a
conversion table generation method of claim 34; and

outputting image data converted in the converting

step.

38. A control program for making a computer execute an image processing method of claim 21.

39. A computer readable memory storing a control
5 program for making a computer execute an image processing method of claim 21.

40. A control program for making a computer execute a table generation method of claim 34.

41. A computer readable memory storing a control
10 program for making a computer execute a table generation method of claim 34.

42. An image sensing apparatus for implementing a color conversion table generation method of claim 34.

43. An image sensing apparatus comprising a color
15 conversion apparatus of claim 35.